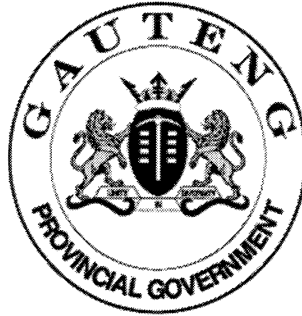


**SENIOR CERTIFICATE EXAMINATION
SENIORSERTIFIKAAT-EKSAMEN**



**OCTOBER / NOVEMBER
OKTOBER / NOVEMBER**

2004

PHYSICAL SCIENCE

***NATUUR- EN
SKEIKUNDE***

**(First Paper: Physics)
(Eerste Vraestel: Fisika)**

LG

304-3/1 LS

PHYSICAL SCIENCE LG: Paper 1

**9 pages
9 bladsye**



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GAUTENGSE DEPARTEMENT VAN ONDERWYS
SENIORSERTIFIKAAT-EKSAMEN

NATUUR- EN SKEIKUNDE LG
(Eerste Vraestel: Fisika)

TYD: 2 uur

PUNTE: 150

BENODIGHEDE:

- Antwoordboek
- Nieprogrammeerbare wetenskaplike sakrekenaar

INSTRUKSIES:

- Maak seker dat jou eksamennommer en toepaslike inligting voor op jou antwoordboek ingevul is.
- Afdeling A – word op die antwoordblad aan die **binnekant van die omslag** van jou **antwoordboek** ingevul.
- Afdeling B – word in die antwoordboek beantwoord.
- Nommer al jou antwoorde **DUIDELIK**.
- Trek 'n lyn na elke antwoord.
- Skryf netjies en duidelik.
- Lees die vrae sorgvuldig deur voordat jy antwoord.

AFDELING A

VRAAG 1

Vir elk van die volgende vrae is daar vier moontlike antwoorde. Merk die antwoord met 'n kruis (X) op die **antwoordblad** aan die **binnekant van die omslag** van jou **antwoordboek**.

Voorbeeld:

A	B	C	D
---	---	--------------	---

Geen punte sal toegeken word as meer as een kruis per antwoord verskyn nie.

1.1 'n Voorwerp met 'n massa van 50 kg het 'n gewig van _____.

- A. 50 N
- B. 500 N
- C. 5 000 N
- D. 5 000 kg

GAUTENG DEPARTMENT OF EDUCATION

SENIOR CERTIFICATE EXAMINATION

PHYSICAL SCIENCE LG
(First Paper: Physics)

TIME: 2 hours

MARKS: 150

REQUIREMENTS:

- Answering book
- Non-programmable scientific calculator

INSTRUCTIONS:

- Make sure that your examination number and all relevant information are filled in on the front page.
- Section A – Must be completed on the **inside page** of your **answer book**.
- Section B – In your answer book.
- Number all your questions clearly.
- Draw a line after each question.
- Write neatly.
- Read the question carefully before answering.

SECTION A

QUESTION 1

There are four possible answers for each question. Mark the correct answer with an (X) on the answer sheet on the **inside cover** of the **answer book**.

Example:

A	B	C	D
---	---	--------------	---

If more than one cross appears per answer, no marks will be allocated.

1.1 An object with a mass of 50 kg has a weight of _____.

- A. 50 N
- B. 500 N
- C. 5 000 N
- D. 5 000 kg

1.2 Die resultante van twee kragte van 3 N en 4 N wat op 'n punt inwerk, is 'n maksimum wanneer die hoek tussen die twee kragte _____ is.

- A. 0°
- B. 60°
- C. 90°
- D. 180°

1.3 As vier voorwerpe **P**, **Q**, **R**, **S** so gelaai word dat **P** deur **Q** afgestoot en **R** deur **S** aangetrek word, watter een van die volgende stelle dui die ladings op die vier voorwerpe korrek aan?

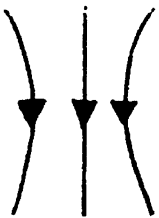
	P	Q	R	S
A.	Negatief	Negatief	Negatief	Positief
B.	Negatief	Positief	Positief	Negatief
C.	Positief	Positief	Negatief	Negatief
D.	Negatief	Positief	Negatief	Positief

1.4 'n Seun het 'n massa van 80 kg. As hy teen 'n stel trappe wat 4 m hoog is in 6 sekondes uithardloop, hoeveel energie verbruik hy?

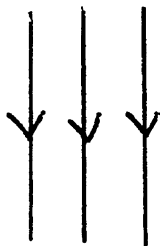
- A. 20 N.s⁻¹
- B. 320 kg.m⁻¹
- C. 3 200 J
- D. 920 J

1.5 Die elektriese veld rondom 'n enkele positiewe puntlading kan die beste voorgestel word deur:

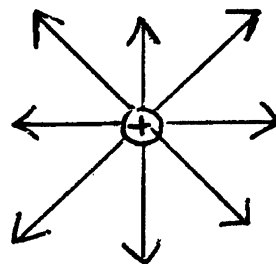
A.



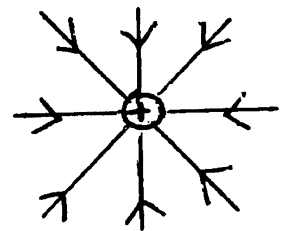
B.



C.



D.



1.2 The resultant of two forces of 3 N and 4 N that act on a point will have a maximum resultant if the angle between the forces is _____.

- A. 0°
- B. 60°
- C. 90°
- D. 180°

1.3 If 4 objects **P**, **Q**, **R**, and **S** are charged in such a manner that **P** repels **Q** and **R** attracts **S**, which of the following sets of information shows the charge of the objects correctly?

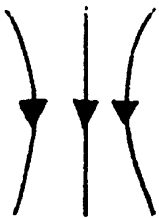
	P	Q	R	S
A.	Negative	Negative	Negative	Positive
B.	Negative	Positive	Positive	Negative
C.	Positive	Positive	Negative	Negative
D.	Negative	Positive	Negative	Positive

1.4 A boy has a mass of 80 kg. If he runs up a flight of stairs that is 4 m high in 6 seconds, how much energy will he have used?

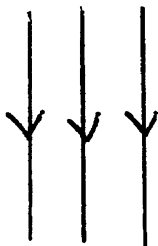
- A. 20 N.s⁻¹
- B. 320 kg.m⁻¹
- C. 3 200 J
- D. 920 J

1.5 The electrical field around a single positive point charge can best be illustrated by _____.

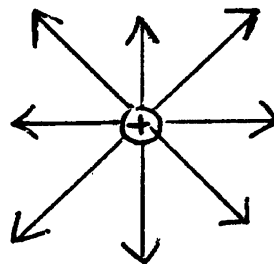
A.



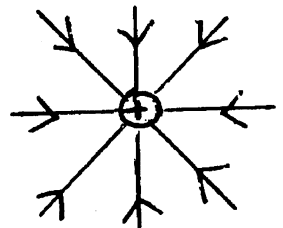
B.



C.



D.



- 1.6 Die gravitasieversnelling, g , op die maan is een vyfde van die van die aarde. As ons die massa en gewig van 'n voorwerp op die maan met die op die aarde vergelyk, dan _____.
- is sy massa en gewig albei kleiner op die maan.
 - is sy massa kleiner maar sy gewig dieselfde op die maan.
 - sy massa dieselfde maar sy gewig kleiner op die maan.
 - is beide sy massa en gewig dieselfde op die aarde en op die maan
- 1.7 'n Voorwerp wat vertikaal opwaarts gegooi word ondervind 'n toename in _____.
- Kinetiese energie
 - Potensiële energie
 - Momentum
 - Gewig
- 1.8 Die totale weerstand van twee (2) identiese weerstande (resistors) van 2 ohm elk wat in parallel geskakel is, is _____.
- 0,3 ohm
 - 3 ohm
 - 9 ohm
 - 1 ohm
- 1.9 Dit neem 'n seun met 'n massa van 25 kg, 5 sekondes om trappe op te hardloop na 'n vloer 10 m hoër. Die arbeid wat verrig word is _____.
- 250 Watt
 - 2 500 N
 - 2 500 J
 - 25 kg
- 1.10 'n Ysterbal van 5 g word 5 m bokant die oppervlakte van die aarde gehou. Die gravitasie potensiële energie van die massastuk is _____.
- 125 J
 - 0,25 J
 - 250 J
 - 2 500 J
- 1.11 Die kinetiese energie van 'n trollie wat 4 kg weeg en wat teen $6 \text{ m}\cdot\text{s}^{-1}$ beweeg is _____.
- 72 J
 - $24 \text{ kg}\cdot\text{m}\cdot\text{s}^{-1}$
 - 12 J
 - 1.5 J

- 1.6 The gravitational acceleration, g , on the moon is one-fifth of that of the earth. If we compare the mass and weight of an object on the moon to that on the earth, then _____.
- the mass and weight are both smaller on the moon.
 - the mass will be smaller but the weight will stay the same on the moon.
 - the mass stays the same but the weight will be smaller on the moon.
 - the mass and the weight will be the same on the earth and the moon.
- 1.7 An object that is thrown vertically upwards undergoes an increase in _____.
- kinetic energy
 - potential energy
 - momentum
 - weight
- 1.8 The total resistance of two resistors of 2 ohms each in parallel will be _____.
- 0,3 ohm
 - 3 ohm
 - 9 ohm
 - 1 ohm
- 1.9 It takes a person who has a mass of 25 kg, 5 seconds to run up a flight of stairs to the next floor that is 10 m higher. The work done by the person will be _____.
- 250 Watt
 - 2 500 N
 - 2 500 J
 - 25 kg
- 1.10 An iron ball of 5 g is held up by a person 5 m above ground level. The gravitational potential energy of the iron ball will be _____.
- 125 J
 - 0,25 J
 - 250 J
 - 2 500 J
- 1.11 A trolley with a mass of 4 kg travels at 6 m.s^{-1} . The kinetic energy of this trolley will be _____.
- 72 J
 - 24 kg.m.s^{-1}
 - 12 J
 - 1.5 J

1.12 Die ohm is die eenheid van _____.

- A. weerstand
- B. potensiaalverskil
- C. elektriese veldsterkte
- D. stroomsterkte

1.13 Die korrekte wyse waarop 'n **ammeter** en 'n **voltmeter** verbind moet word ten einde die weerstand van die gloeilamp te bepaal, is _____.

	Ammeter	Voltmeter
A.	parallel	serie
B.	serie	parallel
C.	parallel	parallel
D.	serie	serie

1.14 Die blaai van 'n positief gelaaiede elektroskoop beweeg nader aan mekaar as 'n voorwerp naby die boonste plaat van die elektroskoop gebring word. Die voorwerp wat nader gebring word, _____.

- A. is negatief gelaai
- B. is positief gelaai
- C. is neutraal
- D. het minder elektrone as protone

1.15 Watter een van die volgende stellings is korrek?

- A. Weerstand absorbeer lading.
- B. Isolators is gewoonlik metale.
- C. Gelaaiede voorwerpe trek mekaar altyd aan.
- D. Gelyksoortige ladings stoot mekaar altyd af.

15x3=(45)

TOTAAL VIR AFDELING A: [45]

1.12 The ohm is the unit of _____.

- A. resistance
- B. potential difference
- C. electrical field strength
- D. current strength

1.13 The correct way to connect an **ammeter** and a **voltmeter** to determine the resistance of the light bulb will be _____.

	Ammeter	Voltmeter
A.	parallel	series
B.	series	parallel
C.	parallel	parallel
D.	series	series

1.14 The leaves of a positive charged electroscope move closer together if an object is brought closer to the top plate of the electroscope. Therefore the object will _____.

- A. have a negative charge.
- B. have a positive charge.
- C. be neutral.
- D. have fewer electrons than protons.

1.15 Which of the following statements is correct?

- A. A resistance absorbs a charge.
- B. Insulators are usually metals.
- C. Charged objects will always attract each other.
- D. Like charges will repel each other.

15x3=(45)

TOTAL FOR SECTION A: [45]

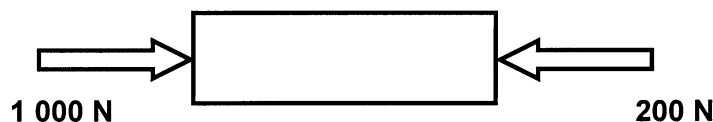
AFDELING B

VRAAG 2

2.1 Gee EEN woord vir elk van die volgende:

- 2.1.1 Die eienskap van 'n voorwerp wat versnelling teenwerk (2)
- 2.1.2 Tempo van verandering in snelheid (2)
- 2.1.3 Die kwantitatiewe meting van traagheid (2)
- 2.1.4 Die een krag wat dieselfde effek het as drie ander kragte wat op 'n punt inwerk. (2)
- 2.1.5 Die vermoë om werk te kan doen (2)
- 2.1.6 Die krag wat 'n versnelling van $1 \text{ m}\cdot\text{s}^{-2}$ aan 'n massa van 1 kg gee as dit daarop inwerk (2)
- 2.1.7 Die tempo waarteen werk gedoen word (2)
- 2.1.8 Die produk van die massa en die snelheid van 'n voorwerp. (2)

2.2



Die voorwerp wat in die skets getoon word, versnel as die kragte, soos aangetoon, daarop inwerk. Watter effek sal dit op die voorwerp se versnelling hê as

- 2.2.1 die 1 000 N krag vergroot word na 1 500 N? (2)
 - 2.2.2 die 200 N krag vergroot word na 400 N terwyl die 1 000 N krag nog inwerk? (2)
 - 2.2.3 die twee kragte ewe groot is? (2)
- 2.3 'n Klip met 'n massa van 5 kg word vanuit 'n stilstaande lugballon laat val op 'n hoogte van 35 m. Bereken
- 2.3.1 die gewig van die klip. (3)
 - 2.3.2 die gravitasie potensiële energie nadat dit 15 m ver geval het. ($g = 10 \text{ m}\cdot\text{s}^{-2}$) (4)

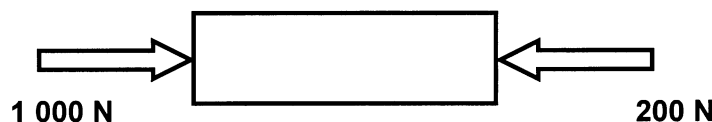
SECTION B

QUESTION 2

2.1 Give ONE word for each of the following:

- | | | |
|-------|--|-----|
| 2.1.1 | The property of an object that resists acceleration | (2) |
| 2.1.2 | The rate of change in velocity | (2) |
| 2.1.3 | The quantitative measure of inertia | (2) |
| 2.1.4 | That single force that has the same effect as three other forces together, that acts on a point | (2) |
| 2.1.5 | The ability to do work | (2) |
| 2.1.6 | The force that causes an acceleration of $1\text{m}\cdot\text{s}^{-2}$ to a mass of 1 kg if it acts on it. | (2) |
| 2.1.7 | The rate at which work is done | (2) |
| 2.1.8 | The product of the mass and the velocity of an object. | (2) |

2.2



The object in the sketch accelerates if the forces act on it, as indicated in the sketch. What effect will it have on the acceleration of the object if

- | | | |
|-------|---|-----|
| 2.2.1 | the 1 000 N force increases to 1 500 N? | (2) |
| 2.2.2 | the 200 N force increases to 400 N while the 1 000 N still acts in on the object? | (2) |
| 2.2.3 | forces acting on the object are of the same size? | (2) |

2.3 A stone with a mass of 5 kg is dropped from a stationary hot air balloon from a height of 35 m. Calculate:

- | | | |
|-------|---|-----|
| 2.3.1 | the weight of the stone. | (3) |
| 2.3.2 | the gravitational potential energy after the stones has fallen 15 m ($g = 10\ \text{m}\cdot\text{s}^{-2}$). | (4) |

- 2.3.3 die kinetiese energie van die klip as dit 'n spoed van $8 \text{ m}\cdot\text{s}^{-1}$ bereik. (4)
- 2.4 Bereken die massa van 'n voorwerp as dit met 'n snelheid van $12 \text{ m}\cdot\text{s}^{-1}$ beweeg terwyl dit 'n momentum van $132 \text{ kg}\cdot\text{m}\cdot\text{s}^{-1}$ het. (3)
- 2.5 'n Trein nader 'n stasie teen $24 \text{ m}\cdot\text{s}^{-1}$. Die trein se remme word aangeslaan vir 5 sekondes en sy spoed verminder na $14 \text{ m}\cdot\text{s}^{-1}$. Bereken die versnelling van die trein. (3)
- 2.6 As arbeid teen 'n tempo van $1,2 \times 10^4 \text{ J}$ per **minuut** verrig word, bereken die arbeidstempo. (4)
- 2.7 'n Hyskraan lig 'n vrag van $17\,600 \text{ N}$ loodreg op. As die arbeid wat op hierdie vrag verrig word $70\,400 \text{ J}$ is, hoe hoog gaan die hyskraan die vrag optel? (4)
- [47]**

VRAAG 3

- 3.1 3.1.1 Wat is **elektriese veldlyne**? (2)
- 3.1.2 Maak 'n netjiese skets van die elektriese veld om 'n positiewe puntlading. (2)
- 3.1.3 Maak 'n skets van die elektriese veldlyne tussen twee negatiewe puntladings. (3)
- 3.2 'n Elektries gelaai staaf word van ver af geleidelik nader gebring na die skyf van 'n positief gelaai elektrokoop sonder om dit aan te raak. Die blaadjies gaan egalig toe. Verklaar hierdie verskynsel. (3)
- 3.3 'n Perspex-staaf word met 'n flennielap gevryf.
- 3.3.1 Wat gebeur wanneer die staaf gevryf word? (2)
- 3.3.2 Watter tipe deeltjies word oor en weer gedra gedurende hierdie proses? (2)
- 3.3.3 Van watter soort elektrisiteit word hier gepraat? (2)
- 3.3.4 Noem enige plek in ons omgewing waar ons hierdie soort elektrisiteit sal vind. (2)
- 3.4 Wat is die gebruik van 'n elektrokoop? (2)
- 3.5 Gee enige DRIE eienskappe van elektriese veldlyne. (3)
- [23]**

- 2.3.3 the kinetic energy of the stone when it reaches a speed of 8 m.s^{-1} . (4)
- 2.4 Calculate the mass of an object if it travels at a velocity of 12 m.s^{-1} and has a momentum of 132 kg.m.s^{-1} . (3)
- 2.5 A train approaches a station at a speed of 24 m.s^{-1} . The train applies brakes for 5 seconds and the speed decreases to 14 m.s^{-1} . Calculate the acceleration of the train. (3)
- 2.6 If work is done at a rate of $1,2 \times 10^4 \text{ J}$ per **minute**, determine the power. (4)
- 2.7 A crane lifts a box weighing $17\,600 \text{ N}$ perpendicularly up. If the work done on the box is $70\,400 \text{ J}$, how high will the crane lift the box? (4)
- [47]**

QUESTION 3

- 3.1 3.1.1 What are **electrical field lines**? (2)
- 3.1.2 Draw a neat sketch of an electrical field around a positive point charge. (2)
- 3.1.3 Draw a neat sketch of electrical field lines between two negative charges. (3)
- 3.2 An electrically charged rod is brought closer to the disk of a positively charged electroscope without touching it. The leaves close evenly. Explain this phenomenon. (3)
- 3.3 A Perspex rod is rubbed with a flannel cloth.
- 3.3.1 What happens when the rod is rubbed? (2)
- 3.3.2 What type of particles are transferred to and fro? (2)
- 3.3.3 What type of electricity is generated? (2)
- 3.3.4 Name a place in our surroundings where we will find this type of electricity. (2)
- 3.4 What is the use of an electroscope? (2)
- 3.5 Give any **THREE** properties of electrical field lines. (3)
- [23]**

VRAAG 4

4.1 Sketsvoorstellings van die volgende soos op 'n ossilloskoop waargeneem:

4.1.1 'n Wisselstroom

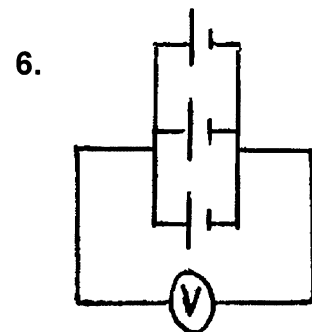
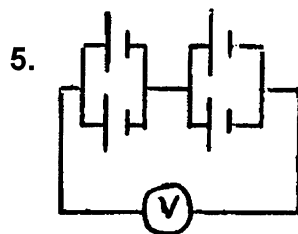
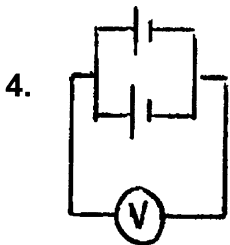
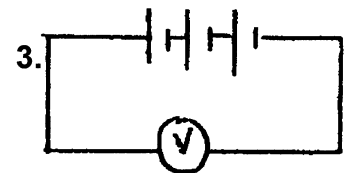
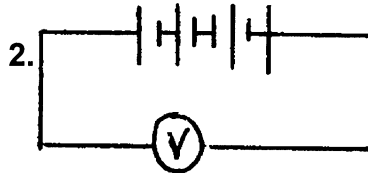
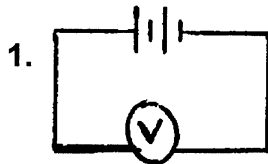
4.1.2 'n Gelykstroom

(4)

4.2 Onderskei tussen die konvensionele vloe van ladings en die elektronvloei-konvensie.

(2)

4.3 'n Seun wat besig is om die potensiaalverskil oor verskeie stroombane te meet, laat per ongeluk al sy lesings deurmekaar raak. Al die selle wat hy gebruik het is 1,5 V. So lyk die verskillende stroombane wat hy opgestel het.



Hier is die lesings wat hy geneem het (en wat deurmekaar geraak het):

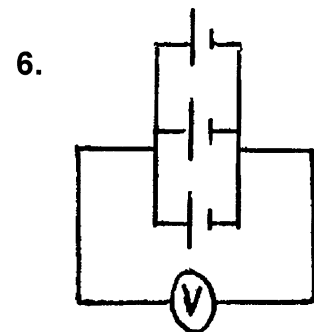
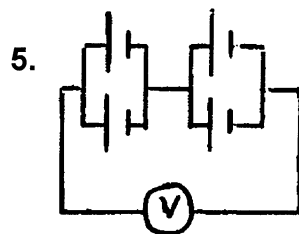
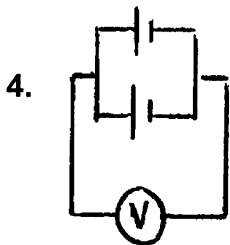
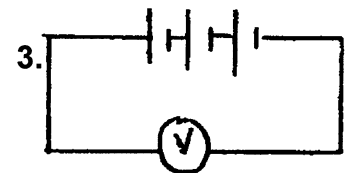
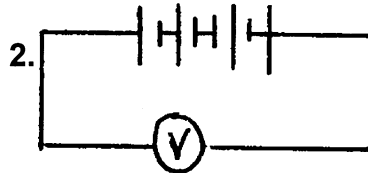
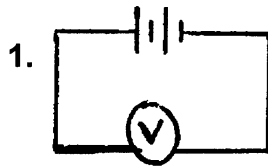
Stroombaan nommer	Voltmeterlesing
1	4.5 V
2	3.0 V
3	1.5 V
4	0.0 V
5	1.5 V
6	3.0 V

4.3.1 Teken die tabel oor en skryf nou die korrekte voltmeterlesings vir elke kring 1 – 6 neer.

(12)

QUESTION 4

- 4.1 Sketch representations of the following as observed on an oscilloscope:
- 4.1.1 An alternating current
- 4.1.2 A direct current (4)
- 4.2 Distinguish between conventional flow of charges and the electron flow convention. (2)
- 4.3 A boy was busy measuring the potential differences of different circuits. By accident all his readings got mixed up. All the cells that he used are 1,5 V. Here are the circuit diagrams that he set up.



Here are the readings that he took (they are all mixed up).

Circuit number	Voltmeter reading
1	4.5 V
2	3.0 V
3	1.5 V
4	0.0 V
5	1.5 V
6	3.0 V

- 4.3.1 Redraw the table and now write down the correct voltmeter readings for circuit 1 – 6. (12)

4.3.2 Watter stroombaan sal aan 'n 1.5 V gloeilamp met normale sterkte die langste elektriese energie voorsien? (2)

4.4 'n Elektriese stroombaan bestaan uit die volgende komponente wat in serie geskakel is: 'n skakelaar, 'n battery, 'n ammeter, 'n verstelbare resistor (reostaat), 'n gloeilamp met 'n weerstand van 2 ohm, en twee parallel geskakelde resistors van 6 ohm en 9 ohm. Die battery lewer 'n emk van 18 V aan die stroombaan. Die reostaat se weerstand is op 0.4 ohm gestel.

4.4.1 Skets die stroombaan. (5)

4.4.2 Bereken die totale weerstand van die parallelle skakeling. (4)

4.4.3 Bereken die totale weerstand van die stroombaan. (3)

4.4.4 Bereken die stroomsterkte van die stroombaan. (3)
[35]

TOTAAL VIR AFDELING B: [105]

TOTAAL: 150

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4.3.2 Which circuit will be able to supply electrical energy the longest to a 1.5 V light bulb of normal strength? (2)

4.4 An electrical circuit consists of the following components that are connected in series: a switch, a battery, an ammeter, a rheostat, a light bulb (resistance = 2 ohm), and two resistors connected in parallel ($r_1 = 6$ ohm and $r_2 = 9$ ohm). The battery delivers an emf of 18 V to the circuit. The variable resistance is set at 0.4 ohm.

4.4.1 Sketch the diagram. (5)

4.4.2 Calculate the total resistance of the parallel connection. (4)

4.4.3 Calculate the total resistance of the circuit. (3)

4.4.4 Determine the current flow through the circuit. (3)

[35]

TOTAL FOR SECTION B: [105]

TOTAL: 150

END